

December 15, 2005  
File No.: 34946

Ms. Catherine Kuhlman  
Executive Officer  
California Regional Water Quality Control Board  
North Coast Region  
5550 Skylane Boulevard, Suite A  
Santa Rosa, California 95403

**SUBJECT: Report of Completion of CAP and ICAP Tasks:  
Boyett Petroleum Site, 171 Santa Rosa Avenue  
Santa Rosa, California (Case No. 1TSR018)**

Dear Ms. Kuhlman:

On behalf of Boyett Petroleum, Kleinfelder is pleased to present this report documenting completion of four tasks in compliance with the Interim Corrective Plan (ICAP) dated December 15, 2003 and the revised Corrective Action Plan (CAP) dated August 15, 2003. The four tasks, in general order of their implementation, are:

1. Groundwater extraction and treatment for plume control during construction,
2. Soil investigation of the site to verify subsurface conditions,
3. Excavation of source contaminants in soil, and
4. Installation of a deep cutoff wall to prevent contaminant migration toward Santa Rosa creek.

Site conditions have changed significantly since the CAP was prepared in 2003:

- An approximate 60 feet by 90 feet excavation of confining layer clay was removed to 22 feet bgs, and replaced by more permeable base material (see Plate 1). This may have significantly altered the hydrogeologic system beneath the site.

- A deep cutoff wall was installed to prevent groundwater flow to the north (see Plate 2). As designed, this should redirect the flow of water from northward to westward.
- Groundwater beneath the site was pumped for approximately 100 days with a capture radius of approximately 100 feet. This likely altered the configuration of the plume beneath much of the site.
- Monitoring wells were decommissioned, and most will be re-located at somewhat different locations (work plan in preparation by Closure Solutions).

There is significant concerns that continued groundwater extraction beneath the site or northwest of the PG&E site may modify the existing plume, re-direct Clarks Auto Body and Empire Cleaners' contaminants toward the Boyett and PG&E site, and increase liability due to further legal action by neighboring property owners. In addition, extraction and treatment of groundwater during the summer of 2004 proved to be extremely costly, and rebuilding the treatment system will likely interfere with the City of Santa Rosa's plans to build a park at the site. As a result, Kleinfelder recommends that based on data provided in this report and resumed groundwater monitoring, an effective remediation method that does not involve extraction be developed, and the CAP be amended accordingly.

## Introduction

A variety of environmental and logistical impediments required that Boyett implement part of the CAP in conjunction with the City of Santa Rosa Prince Memorial Greenway Project (PMGP), a major restoration of Santa Rosa Creek along the north boundary of the Boyett site and PG&E substation. Working with the City allowed Boyett to install the cutoff wall along the bank of the creek and remove petroleum-impacted soil within the creek as part of the project.

The PMGP was a major construction project involving removal of the old creek liner, excavating contaminated soil within the creek bottom, and installing a new liner, scour protection, retaining walls, and walkways. In accordance with bid documents and technical specifications, the City's contractor performed soil excavation and the installation of the cutoff wall. Kleinfelder and its Subconsultants independently conducted the groundwater extraction and the soil investigation.

## Groundwater Extraction

Groundwater extraction was conducted in accordance with the ICAP, the Report of Completion dated February 2, 2004, and an Addendum to the Report of Completion dated March 23, 2004.

Groundwater was pumped from two wells (MW-1 and MW-12) at a target flow rate of 5 gpm each. Water was extracted solely at 10 gpm from MW-1 when MW-12 was decommissioned prior to soil excavation. Water was pumped using Grundfos Readyflo 2 stainless steel downhole pumps, which were chosen because they are designed specifically for pumping contaminated water and have the capacity to pump well over the 35 feet of head on this project. Water flowed through 1-inch diameter Schedule 80 PVC pipes that were double-contained in 2-inch diameter Schedule 40 PVC pipes.

Water flowed into a 22,000-gallon clarifying tank equipped with a water level meter to remove bulk sediment, and then through a 5-micron pre-filter to remove fine particulates. Water then flowed through two 55-gallon granulated activated charcoal (GAC) canisters that treated the water by stripping hydrocarbons and VOC's by adsorption. The first canister removed target contaminants from the water, while the second canister served as a backup unit in the event of breakthrough. Treated water was at first pumped into a second 22,000-gallon holding tank and discharged in batch, then discharged directly into the sewer system after the functionality of the treatment system was assured.

Flow was controlled using a control box located near the treatment system, and monitored using in-line flow meters. Several check valves were installed to prevent backflow to the wells in the event of electrical or system failure. Sampling ports were placed in front of the GAC canisters to measure hydrocarbon concentrations entering the system, between the two canisters to monitor for breakthrough, and after the canisters to test treated water for compliance with the discharge permit.

The system was tested and water sampled on January 29<sup>th</sup>, 2004. The City of Santa Rosa Fire Department inspected the system on January 30<sup>th</sup>, and reinspected and approved it on February 2<sup>nd</sup>. The City of Santa Rosa approved discharge to the sewer system on February 6<sup>th</sup>. The system operated until approximately mid-July when it was converted to accept and treat water from dewatering activities associated with the PMGP.

Contaminant removal rates were calculated using the three inflow test results (Table 1). Only constituents that were detected at least once were included.

Laboratory data is provided in Appendix A. Based on the average concentrations using one-half the detection limit for ND, and assuming that these averages are representative over the 135 days that the extraction system operated, the total mass that was removed from the site was 706 grams of total hydrocarbons and 60 grams of VOC's, with a total contaminant removal of 766 grams.

## **Soil Investigation**

### *Groundwater Monitoring Well Destruction*

Kleinfelder contracted with Woodward Drilling of Rio Vista, California to destroy five monitoring wells at the site. The monitoring wells (MW-1, MW-2, MW-3, MW-4A and MW-13A) were destroyed by over-drilling them with an 8-inch hollow stem auger. Upon reaching the bottom of each well, the auger and well casing were removed in 5-foot intervals. Once the casing and auger were removed, the hole was grouted using a mixture of bentonite and neat Portland cement.

Investigative derived waste (IDW), including steam cleaning rinsate and soil cuttings was stored on-site in 55-gallon drums. Phillips Transportation and Remediation of Benicia removed the material prior to the commencement of PMGP excavation activities.

### *Soil Sampling*

A total of eleven soil borings were drilled at the locations shown on Plate 1. Boring logs are presented in Plates A-1 through A-14. Drilling was conducted by Woodward Drilling and supervised by a Kleinfelder environmental technician. The borings were advanced to 22.5 feet below ground surface (bgs) using a truck-mounted drill rig equipped with an 8-inch diameter hollow stem auger. Groundwater was encountered during drilling at a depth of 23.5 feet bgs.

Kleinfelder collected soil samples at 1-foot below ground surface and at 5-foot intervals to the bottom of each boring. Sampling was achieved by driving a 2-inch (inside diameter) Modified California sampler containing brass liners in advance of the augers. The sampler was advanced by dropping a 140-pound hammer 30-inches. All soil samples were collected in brass liners, the ends covered with Teflon sheeting and sealed with plastic end caps. The sample locations were noted on a field record sheet. The soil samples were labeled with a unique identification number, placed in an iced chest, and transported under chain-of-

custody documentation to a State of California certified laboratory for analytical testing. Each boring was properly grouted at the end of the investigation in accordance with CSEHD regulations.

### *Investigation Derived Waste*

Investigation derived wastes (IDW) including soil cuttings generated during project work and equipment-cleaning rinsate were stored on-site in a designated area in 55-gallon drums. Phillips Transportation and Remediation of Benicia removed the material prior to the commencement of excavation activities.

### *Chemical Analysis*

McC Campbell Analytical Inc. of Pacheco, California performed chemical analysis of the samples. McC Campbell is certified by the State of California to perform the requested analysis. Samples were analyzed on a standard seven-day turnaround basis.

All samples were analyzed for the following:

- Total Petroleum Hydrocarbons as diesel (TPH-d) using EPA Test Method 8015, and
- Total Petroleum Hydrocarbons as gasoline (TPH-g), benzene, toluene, ethylbenzene, and xylenes (BTEX), and methyl tertiary butyl ether (MTBE) using EPA Test Method 8015.

In addition, the lowermost two samples collected at and above the saturated zone were analyzed for the following:

- Volatile Organic Compounds (VOC's) using EPA Test Method 8260, and
- Total lead using EPA Test Method 8010

To characterize the excavated material for landfill acceptance, the four discreet samples collected at each depth were composited by the laboratory and analyzed for the following:

- Total Petroleum Hydrocarbons as diesel (TPH-d) using EPA Test Method 8015,
- Total Petroleum Hydrocarbons as gasoline (TPH-g), benzene, toluene, ethylbenzene, and xylenes (BTEX), and methyl tertiary butyl ether (MTBE) using EPA Test Method 8015,
- LUFT metals using EPA Test Method 6010, and
- VOC's by EPA Test Method 8260.

### *Findings*

The results of chemical analysis are presented on Table 2. Laboratory data is presented in Appendix B. Most of the impacted soil represented by borings KB-1, KB-2, KB-3, KB-4, KB-5, KB-12, and KB-13 was removed during the excavation phase of the PMGP. However, test results from borings KB-8, KB-9, and KB-10 indicate that petroleum hydrocarbons as diesel fuel, gasoline, benzene, toluene, ethylbenzene and xylenes remain outside of the extent of the previous and the PMGP excavations. Most notably, diesel concentrations of 1,500 mg/kg and benzene concentrations of 61 ug/kg remain in the smear zone above the aquifer at about 21 to 22 feet bgs beneath soil at boring KB-14. This area could not be excavated during the PMGP because it was used as a staging area and drive-through for trucks and heavy equipment.

### **Soil Excavation**

Excavation activities within the primary excavation (see Plate 1) began on Wednesday, May 19, 2004 and completed on Friday, July 9, 2004. Additional soil removal within the creek along the length of the project continued until October 15<sup>th</sup>, 2004. Soil materials were excavated using an excavator capable of depths of more than 25 feet bgs. As the upper five feet of soil was removed and stockpiled, shoring was driven in place to stabilize excavation sidewalls and allow for excavation of soil to approximately 27 feet bgs. The excavated soil was stockpiled and then later loaded onto dump trucks that transported the material to Potrero Hills Landfill who pre-approved acceptance of the soil.

The aerial extent of the excavation is shown on Plate 1 and the resulting excavation was approximately 27 feet below ground surface (excavation stopped when the water-bearing silty sand unit was encountered). Due to safety concerns and the potential impact to the redwood trees along the western site boundary, the

limit of the west side of the excavation was placed 15 feet from the redwood trees following a study by a Kleinfelder biologist. The eastern extent was limited by a requirement that the northeastern corner of the site be used as a staging area for the PMGP and as a drive-through for trucks and heavy equipment. The southern boundary was selected the excavation entered the previously placed clean fill from former excavation no. 1, and samples from boring KB-8 indicate that this area is outside of the major zone of petroleum-impacted material within the 22-foot depth smear zone (see Plate 1 and Table 2). The northern part of the excavation continued into the creek bottom.

The excavation activities resulted in the transportation and disposal of approximately 10,169 tons of material. A large collection of waste manifests, not included within this report, are filed at Boyett Petroleum and are available to the Water Board upon request.

### *Confirmation Sampling*

Kleinfelder anticipated collecting one confirmation sample per every 20 linear feet of sidewall and every 400 square feet of the floor of the excavation. However, due to shoring problems sidewall confirmation samples were not obtained along the south side of the excavation and only one bottom confirmation samples were obtained because of excessive groundwater issues. Confirmation samples were collected just above the water-bearing zone because test data and visual observations indicate that the smear zone between 21 and 23 feet bgs is the most highly impacted horizon.

Each sidewall sample was collected in both a discrete soil core sampler and a brass sampling tube and placed on ice for submittal to the laboratory. The soil core samplers were capped and sealed as directed on the manufacturer insert and the brass tubes were covered with Teflon, and end-capped. A total of 14 samples were collected from the excavation. Each sample was given a unique identification number, located on a site map, and logged onto a chain-of-custody form. The locations of the confirmation samples are provided in Plate 1.

The samples were submitted to the McCampbell Analytical for analysis. Each sample was analyzed for TPH-mo, TPH-d, TPH-g, BTEX and MTBE by EPA method 8015, for LUFT Metals by EPA method 6010 and for VOC's by EPA Method 5035.

### *Sample Results*

The results of chemical analysis performed on confirmation samples collected during excavation activities are presented on Table 1. Laboratory data is provided in Appendix C. The data indicate that while excavation removed the bulk of the petroleum-impacted soil at the site, some impacted soil remains. Note that the soil represented by confirmation samples 12, 13, and 14 was later removed during the excavation of the creek bottom by the City of Santa Rosa. Confirmation samples collected by Kleinfelder shown as SRC-1, SRC-2, SRC-3, and SRC-4 detected no measurable concentrations of motor oil, gasoline, diesel, or BTEX.

### *Backfilling and Compaction*

Backfilling of the excavation began when the bottom reached 27 feet below ground surface and the groundwater had been pumped from the excavation to the groundwater remediation system. In order to bridge the soft bottom of the excavation 6-inch minus backfill material was placed in the bottom of the excavation and compacted with the excavator. Stabilization fabric was then placed over the 6-inch minus material and approved imported fill was placed and compacted in 1-foot level lifts and compacted using either the excavator or a sheep-foot compactor. Kleinfelder conducted inspection and testing of the imported material, and final density according to ASTM D1557.

### **Installation of the Groundwater Cutoff Wall**

The preferred method specified in the CAP to prevent the northward migration of contaminants toward Santa Rosa creek was to construct a cutoff wall across the water-bearing zone. The feasibility and effectiveness of a wall was evaluated through a CPT investigation across the Boyett and PG&E site (*Presentation of Cone Penetration Test Data, PG&E Substation, dated July 3<sup>rd</sup>, 2003*). The results of the CPT investigation indicated that a cutoff wall anchored within the clay units above and below the water-bearing zone was feasible and would provide an effective barrier to groundwater migration.

Based on the results of the CPT investigation and previous soil and groundwater investigations, Winzler and Kelly, under subcontract to Kleinfelder, prepared engineering plans as part of the technical specifications for the PMGP. The bid document specified the wall be constructed of interlocking high strength single sheet piles, and sealed at the joints with a water-tight sealant. The piles were specified to be driven five feet into the lower clay unit, with the top extending at least five feet within the upper clay unit.



The cutoff wall was installed over a three-week period during the month of July, 2004. The location of the wall showing its position relative to the groundwater plume measured in December, 2003, is shown in Plate 2. A Kleinfelder inspector was present throughout the installation to assure conformance with the specifications. The location of the wall was located by surveying the position where the 35 foot length of the sheet pile, when driven three feet into the creek bank, would be anchored five feet into the lower clay unit. The Construction of the wall started at the western PG&E property boundary, and continued until the midpoint of the Boyett site was reached.

## **Summary and Conclusions**

The tasks described in this report documents the completion of certain tasks in accordance with the Corrective Action Plan and the Interim Corrective Action Plan.

Completed elements of the Corrective Action Plan are as follows:

- Installation of the groundwater cutoff wall.
- Source-contaminant removal by excavating the deep petroleum-impacted smear zone.

While the area excavated during the Prince Memorial Greenway Project exceeded the size of the area specified in the CAP, sidewall confirmation tests and data gathered during the soil investigation indicate that petroleum-impacted soil remains within smear-zone contaminants along the eastern and western side of the excavation (see Plate 1).

The completed element of the ICAP is:

- Groundwater extraction, treatment, and discharge under permit.

Source-region soil was removed to the extent practicable, and the extraction system was removed following installation of the cutoff wall. Further soil excavation is not recommended at this time because the bulk of source-region soil has been removed during the PMGP and during two prior excavations (see Plate 1). Re-establishing the extraction system on the Boyett site is not recommended at this time because volatile organic compounds in water entering the treatment system indicate that the continued pumping will draw contaminants from the Clark's and Empire Cleaners plumes to beneath the PG&E and Boyett sites. As a

result, Kleinfelder recommends that the feasibility of more passive techniques that do not involve soil removal or groundwater extraction be developed, and the CAP be amended accordingly.

Please feel free to call me at 707-429-4070 if you have any questions.

Sincerely,

**KLEINFELDER, INC.**



Bradley G. Erskine, Ph.D., CEG, CHg

cc: Joan Fleck, North Coast Regional Water Quality Control Board  
Jessica Holcombe, Boyett Petroleum  
Ron Chinn, Closure Solutions

**List of Tables, Plates, and Appendices**

Table 1: Contaminant Removal Rates

Table 2: Soil Analytical Results

Table 3: Confirmation Soil Analytical Results

Plate 1: Boring and Confirmation Test Locations

Plate 2: Location of Cutoff Wall

Appendix A: Laboratory Test Data

**TABLE 1**  
**CONTAMINANT REMOVAL RATES**  
**BOYETT PETROLEUM SITE**

CONSTITUENT	INFLOW				OUTFLOW	AMOUNT REMOVED	REMOVAL RATE	TOTAL REMOVED
	3/9/04	5/5/04	6/2/04	Average				
TPH-D	320	140	58	173	ND	173	2.83	381.92
TPH-G	230	110	100	147	ND	147	2.40	324.53
<b>TOTAL HYDROCARBONS</b>						<b>5.23</b>		<b>706.45</b>
Benzene	7.8	6.8	10	8.2	ND	8.2	0.13	18.10
2-butanone (MEK)	ND	ND	24	8.3	ND	8.3	0.14	18.32
Ethylbenzene	0.94	ND	0.94	0.79	ND	0.79	0.01	1.74
n-propyl benzene	0.67	ND	ND	0.56	ND	0.56	0.01	1.24
Diisopropyl ether (DIPE)	2.1	1.3	ND	1.3	ND	1.3	0.02	2.87
Isopropylbenzene	0.58	ND	ND	0.53	ND	0.53	0.01	1.17
Methyl-t-butyl ether (MTBE)	0.65	0.6	ND	0.4	ND	0.4	0.01	0.88
4-Methyl-2-pentanone (MIBK)	7.5	ND	ND	2.8	ND	2.8	0.05	6.18
Toluene	2.5	ND	ND	1.2	ND	1.2	0.02	2.65
1,2,4 trimethylbenzene	ND	ND	1.1	0.7	ND	0.7	0.01	1.55
Xylenes	2.9	ND	ND	1.3	ND	2.4	0.04	5.30
<b>TOTAL VOC's</b>						<b>0.44</b>		<b>60.00</b>
<b>TOTAL CONTAMINANTS</b>						<b>5.68</b>		<b>766.45</b>

**NOTES**

Only constituents with measurable concentrations are included  
 ND=1/2 detection limit for average concentrations; ND=0 for outflow values  
 Concentrations in ug/l  
 Removal Rates in grams/day  
 Total Removed in grams

**TABLE 2**  
**SOIL ANALYTICAL RESULTS**  
**BOYETT SITE**

		Concentrations in mg/kg																											
		Metals							VOCs																				
Sample Location	Sample Depth(ft)	TPH-d	TPH-g	B	T	E	X	MTBE	Cd	Cr	Pb	Ni	Zn	STLC Cr	1,1,2-Tri chloroethane	n-Butyl benzene	Ethylbenzene	Napthalene	n-Propyl benzene	1,2,4-Tri methylnzene	1,3,5-Tri methylnenze	Xylene	Benzene	4-Isopropyl toluene	sec-Butyl benzene	Isopropyl benzene	Toluene		
KB-1-4-1	Comp-1	ND	ND	ND	ND	ND	ND	ND	ND	31	25	36	55	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
KB-1-4-2	Comp-5	ND	ND	ND	ND	ND	ND	ND	ND	34	11	32	40	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
KB-1-4-3	Comp-10	17	ND	ND	ND	ND	ND	ND	ND	75	9.1	93	51	0.26	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
KD-1-4-4	Comp-15	220	240	ND	0.59	3.9	2.4	ND	ND	100	5.5	110	51	0.34	ND	ND	4	11	3.7	28	4.3	2.1	ND	ND	ND	ND	ND	ND	
KB-1-4-5	Comp-20	15	66	0.089	0.37	0.11	0.12	ND	ND	54	10	60	39	ND	ND	0.054	0.049	0.076	0.049	0.12	0.033	0.044	0.04	0.0091	0.018	0.014	ND	ND	
KB-1-4-6	Comp-22.5	370	190	0.4	0.59	1.6	5.6	ND	ND	41	8	53	34	ND	ND	1.7	1.6	5	1.5	6.3	1.9	5.7	ND	ND	0.41	0.43	ND	ND	
KB-1-1	1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-1-2	5	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-1-3	10	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-1-4	15	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-1-5	20	20	78	0.61	0.37	1.9	1.3	0.97	NA	NA	7.2	NA	NA	NA	ND	0.2	0.87	0.4	0.32	1.5	0.33	0.57	0.13	ND	ND	ND	ND	ND	
KB-1-6	22.5	320	380	1.3	2.6	8.4	2.8	ND	NA	NA	8.3	NA	NA	NA	ND	0.55	1.5	1.1	0.85	ND	0.17	0.25	0.2	ND	0.16	0.2	ND	ND	
KB-2-1	1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-2-2	5	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-2-3	10	28	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-2-4	15	320	25	ND	0.2	0.029	0.097	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-2-5	20	51	100	ND	1	ND	0.09	ND	NA	NA	9.5	NA	NA	NA	ND	0.16	ND	ND	0.045	ND	ND	ND	0.0072	0.011	0.1	0.034	ND	ND	
KB-2-6	22.5	ND	ND	ND	ND	ND	ND	ND	NA	NA	8.9	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
KB-3-1	1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-3-2	5	ND	ND	ND	ND	0.0057	0.0053	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-3-3	10	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-3-4	15	11	1.7	0.014	ND	0.013	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	
KB-3-5	20	110	400	2.5	ND	ND	ND	ND	NA	NA	8.6	NA	NA	NA	ND	0.17	0.024	ND	0.32	0.015	0.032	0.065	0.2	0.038	0.063	0.1	0.014		
KB-3-6	22.5	1200	350	2.5	ND	0.71	2	ND	NA	NA	6.1	NA	NA	NA	ND	0.95	0.74	6.1	2.2	0.16	0.38	2.3	1.5	ND	ND	0.86	0.3		
KB-4-1	1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-4-2	5	2.8	1.2	0.0095	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-4-3	10	2.2	1.2	ND	0.006	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-4-4	15	1800	1800	1	9.4	75	42	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-4-5	20	3.1	2.2	0.34	0.0058	0.063	0.14	ND	NA	NA	9.9	NA	NA	NA	ND	1.3	3.8	2.4	1.6	10	3.1	13	0.76	ND	ND	410	ND	ND	
KB-4-6	22.5	610	2600	22	38	77	310	20	NA	NA	7.3	NA	NA	NA	ND	8.4	39	17	13	77	23	160	9.5	ND	ND	3.6	6.2		
KB-5-1	1	3.1	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-5-2	5	33	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-5-3	10	ND	ND	ND	ND	0.014	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-5-4	15	39	59	0.048	0.44	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-5-5	20	4.2	4.5	0.037	0.011	0.1	ND	ND	NA	NA	8.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-5-6	22.5	58	280	ND	2	1.4	ND	ND	NA	NA	9.9	NA	NA	NA	ND	0.64	0.58	ND	0.93	ND	ND	ND	0.033	ND	0.21	0.25	ND		
KB-8-1	1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-8-2	5	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-8-3	10	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-8-4	15	250	560	ND	1	1.1	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-8-5	20	42	240	0.78	0.25	2	3.6	ND	NA	NA	9.8	NA	NA	NA	ND	0.91	2.4	1	1.2	6.7	2.3	3.2	ND	ND	ND	0.29	0.27		
KB-8-6	22.5	ND	ND	ND	ND	ND	ND	ND	NA	NA	7.2	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
KB-9-1	1	ND	1.0	ND	ND	0.089	0.039	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-9-2	5	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-9-3	10	1.2	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-9-4	15	2.6	ND	ND	ND	ND	ND	ND	NA	NA	6.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-9-5	20	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-10-1	1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-10-2	5	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-10-3	10	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-10-4	15	190	550	ND	ND	ND	4.0	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-10-5	20	13	86	ND	0.081	0.072	0.083	ND	NA	NA	7.9	NA	NA	NA	ND	0.34	0.053	ND	0.75	ND	ND	ND	ND	ND	0.21	0.18	ND	ND	
KB-10-6	22.5	ND	ND	ND	ND	ND	ND	ND	NA	NA	6.4	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
KB-12-1	1	6.2	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-12-2	5	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-12-3	10	4	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-12-4	15	970	590	ND	3.9	ND	0.23	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-12-5	20	110	79	0.15	0.47	0.04	0.062	ND	NA	NA	11	NA	NA	NA	ND	0.43	ND	ND	0.54	ND	ND	0.025	0.094	ND	0.17	0.18	ND	ND	
KB-12-6	22.5	550	230	0.32	0.8	0.12	0.22	ND	NA	NA	9.1	NA	NA	NA	ND	1.1	ND	0.8	1.5	ND	ND	ND	ND	ND	0.44	0.43	ND	ND	
KB-13-1	1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-13-2	5	18	7.3	0.17	0.019	0.21	0.028	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-13-3	10	130	400	0.58	1.9	3.6	1.9	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
KB-																													

<b>NOTES:</b>		
TPH-d - Total Petroleum Hydrocarbons as Diesel	B - Benzene	Cd - Cadmium
TPH-g - Total Petroleum Hydrocarbons as Gasoline	T - Toluene	Cr - Chromium
ND - Not Detected	E - Ethylbenzene	Pb - Lead
NA - Not Analyzed	X - Xylene	Ni - Nickel
		Zn - Zinc

**TABLE 3**  
**CONFIRMATION SOIL ANALYTICAL RESULTS**  
**BOYETT SITE**

Sample Location	Sample Depth(ft)	Concentrations in mg/kg							
		Petroleum Hydrocarbons							
		TPH-mo	TPH-d	TPH-g	B	T	E	X	MTBE
1	23'	57	240	19	0.21	0.053	0.034	0.042	ND
2	23'	7	29	30	0.008	0.094	ND	0.013	ND
3	23'	1400	3200	720	3.1	2.1	0.13	1.6	ND
4	23'	7.6	48	18	0.16	0.069	0.42	0.91	ND
5	23'	12	320	690	1.2	1.6	6.5	2.9	ND
6	23'	32	200	63	ND	0.39	0.14	0.23	ND
7	23'	34	160	76	ND	0.4	0.13	0.098	ND
Bay 8 Cell A	23'	ND	ND	ND	0.0086	0.015	0.0081	0.0087	ND
CSSW-8	23'	210	130	53	0.061	0.14	0.022	0.12	ND
CSSW-9	23'	220	780	1500	1.2	8	ND	5.1	ND
11	23'	240	760	420	2.2	2	0.67	0.86	ND
12	23'	180	450	290	1.6	1.1	0.13	0.94	ND
13	23'	120	280	12	0.095	0.036	0.021	0.048	ND
14	23'	7.5	9.9	3.4	0.013	0.014	0.0083	0.054	ND
SRC-1	3'	5.7	3.2	ND	ND	ND	ND	ND	ND
SRC-2	3'	7.5	2.1	ND	ND	ND	ND	ND	ND
SRC-3	3'	9.6	3.5	ND	ND	ND	ND	ND	ND
SRC-4	3'	29	17	ND	ND	ND	ND	ND	ND

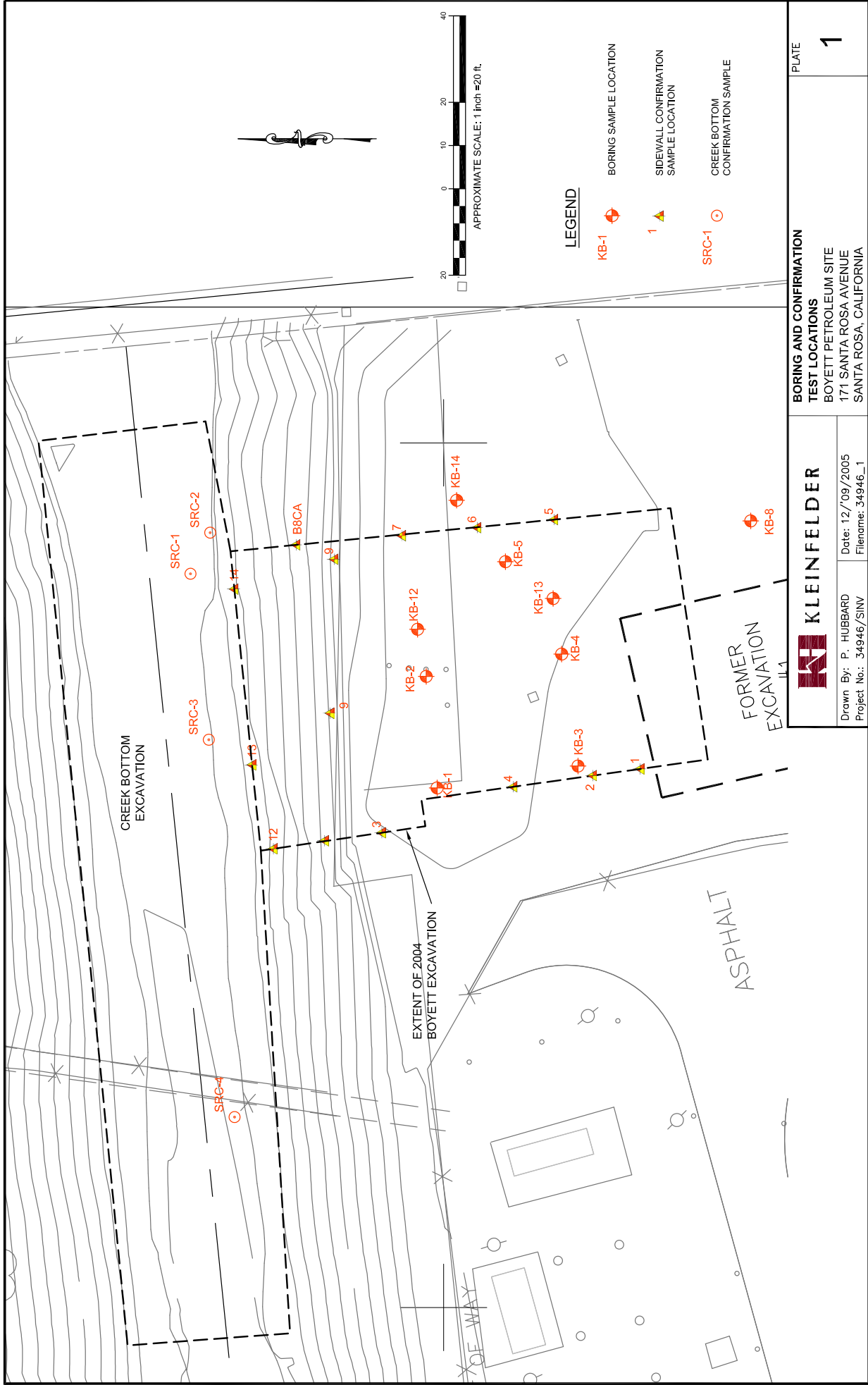
Sample Location	Sample Depth(ft)	Concentrations in mg/kg				
		Metals				
		Cd	Cr	Pb	Ni	Zn
1	23'	ND	140	8.9	170	66
2	23'	ND	57	9.3	55	38
3	23'	ND	49	7.8	56	33
4	23'	ND	54	9	54	42
5	23'	ND	98	14	140	68
6	23'	ND	55	23	26	16
7	23'	ND	55	22	27	35
Bay 8 Cell A	23'	ND	34	5.5	35	25
CSSW-8	23'	ND	68	7.1	100	41
CSSW-9	23'	ND	49	46	37	42
11	23'	ND	76	9.4	99	45
12	23'	ND	61	12	79	59
13	23'	ND	86	10	120	57
14	23'	ND	83	15	110	59
SRC-1	3'	ND	70	94	89	130
SRC-2	3'	ND	85	14	110	56
SRC-3	3'	3.3	82	110	64	950
SRC-4	3'	ND	91	46	100	98

Sample Location	Sample Depth(ft)	Concentrations in mg/kg											
		VOC's											
		n-Butyl benzene	Ethylbenzene	Naphthalene	n-Propyl benzene	1,2,4-Tri methylbenzene	1,3,5-Tri methylbenzene	Xylene	Benzene	4-Isopropyl toluene	sec-Butyl benzene	Isopropyl benzene	Toluene
1	23'	0.57	0.44	ND	0.9	0.92	0.4	0.29	0.2	ND	0.16	0.36	ND
2	23'	0.014	ND	ND	0.038	ND	ND	ND	0.0053	ND	0.013	0.018	ND
3	23'	1.6	0.51	ND	3.9	ND	0.12	0.74	4.4	ND	0.48	1.5	0.16
4	23'	0.66	2.3	1.8	0.85	5.7	1.3	3.9	0.44	ND	ND	0.3	ND
5	23'	5	9	10	5.7	18	6.4	7.7	ND	ND	0.99	2	ND
6	23'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	23'	2.1	5	3.6	3.1	ND	0.27	1.4	ND	ND	0.58	1.1	ND
Bay 8 Cell A	23'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CSSW-8	23'	0.025	ND	ND	0.054	ND	ND	0.028	ND	ND	0.02	0.05	ND
CSSW-9	23'	1.6	ND	1.2	3.4	ND	ND	ND	ND	ND	0.5	1.2	ND
11	23'	0.31	0.16	ND	0.44	0.31	0.093	0.18	0.12	ND	0.078	0.15	ND
12	23'	0.53	ND	ND	0.87	ND	ND	0.28	0.3	ND	0.17	0.36	ND
13	23'	0.062	0.0052	ND	0.09	0.0068	0.0085	0.02	0.0066	ND	0.023	0.034	ND
14	23'	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

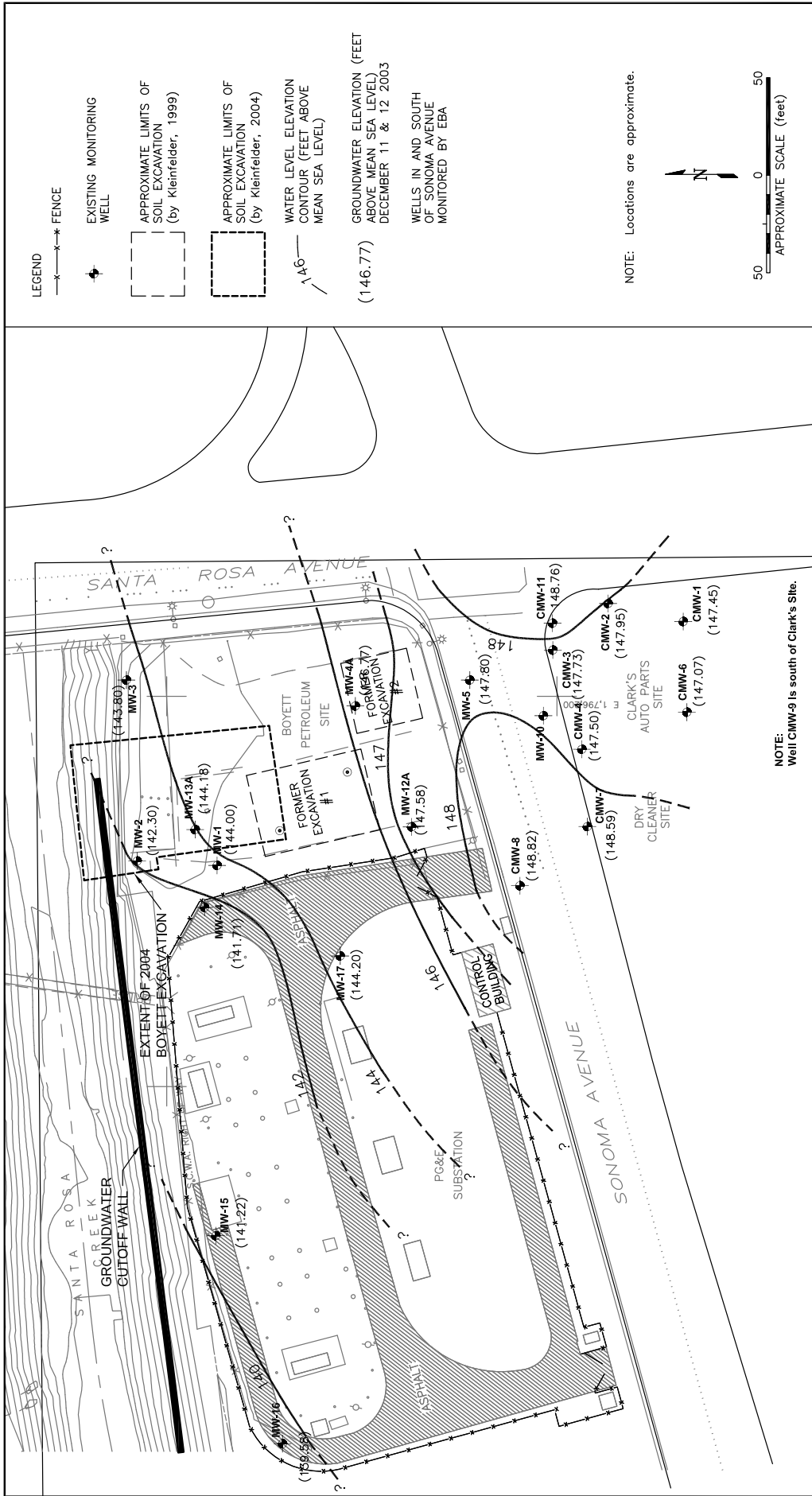
**Notes:**

TPH-mo - Total Petroleum Hydrocarbons as Motor Oil  
 TPH-d - Total Petroleum Hydrocarbons as Diesel  
 TPH-g - Total Petroleum Hydrocarbons as Gasoline  
 ND - Not Detected  
 NA - Not Analyzed

Cd - Cadmium  
 Cr - Chromium  
 Pb - Lead  
 Ni - Nickel  
 Zn - Zinc  
 B - Benzene  
 T - Toluene  
 E - Ethylbenzene  
 X - Xylene


















 <b>KLEINFELDER</b>		<b>BORING AND CONFIRMATION TEST LOCATIONS</b>  BOYETT PETROLEUM SITE 171 SANTA ROSA AVENUE SANTA ROSA, CALIFORNIA	<b>PLATE</b>  <b>1</b>
Drawn By: P. HUBBARD	Date: 12/09/2005		
Project No.: 34946/SINV	Filename: 34946_1		



LOCATION OF CUTOFF WALL		PLATE	
	DRAFTED BY: P. Hubbard	2	
	CHECKED BY: B. Erskine		
BOYETT PETROLEUM SITE 171 SANTA ROSA AVENUE SANTA ROSA, CALIFORNIA		PROJECT NO. 34946—SINV	
DATE: 12/9/05		DATE: 12/9/05	

# UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS  (More than half of material is larger than the #200 sieve)	GRAVELS  (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LITTLE OR NO FINES	 GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			 GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	 GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			 GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS  (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LITTLE OR NO FINES	 SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			 SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	 SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			 SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS  (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS  (Liquid limit less than 50)		 ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			 CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			 OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS  (Liquid limit greater than 50)		 MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			 CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			 OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY
		HIGHLY ORGANIC SOILS		 PT



## UNIFIED SOIL CLASSIFICATION SYSTEM

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

A-1

Drafted By: D. Ross      Project No.: 34946/SINV  
Date: 7/23/2004      File Number: 34946

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KAUSCS 34946.GPJ 7/23/04



## LOG SYMBOLS

	BULK / BAG SAMPLE	-4	PERCENT FINER THAN THE NO. 4 SIEVE (ASTM Test Method C 136)
	MODIFIED CALIFORNIA SAMPLER (2-1/2 inch outside diameter)	-200	PERCENT FINER THAN THE NO. 200 SIEVE (ASTM Test Method C 117)
	CALIFORNIA SAMPLER (3 inch outside diameter)	LL	LIQUID LIMIT (ASTM Test Method D 4318)
	STANDARD PENETRATION SPLIT SPOON SAMPLER (2 inch outside diameter)	PI	PLASTICITY INDEX (ASTM Test Method D 4318)
	CONTINUOUS CORE	TXCU	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (EM 1110-1-1906)
	SHELBY TUBE	EI	EXPANSION INDEX (UBC STANDARD 18-2)
	ROCK CORE	COL	COLLAPSE POTENTIAL
	WATER LEVEL (level where first encountered)	UC	UNCONFINED COMPRESSION (ASTM Test Method D 2166)
	WATER LEVEL (level after completion)		
	SEEPAGE	MC	MOISTURE CONTENT (ASTM Test Method D 2216)

## GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil conditions between individual sample locations.
3. Logs represent general soil conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification System designations presented on the logs were evaluated by visual methods. Where laboratory tests were performed, the designations reflect the laboratory test results.



### LOG KEY

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

### PLATE

A-2

Drafted By: D. Ross      Project No.: 34946/SINV  
Date: 7/23/2004      File Number: 34946

Surface Conditions: Gravel.

Date Completed: 5/10/2004

Groundwater: No free groundwater encountered.







Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 26-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Geotechnical Log													
Depth (feet)	Sample Type	Sample No.	FIELD			LABORATORY						Lithography	DESCRIPTION
			Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests		
		KB-1-1	52									 <b>GRAVEL:</b> Angular, approximately 3 inches thick (Fill) <b>Silty CLAY (CL/ML):</b> Dark brown, moist, medium stiff, trace brick fragments	
5		KB-1-2	40										
10		KB-1-3	22									 <b>Silty CLAY (CL):</b> Brown, moist, medium stiff, slight petroleum odor	
15		KB-1-4	26									 <b>Silty CLAY (CL):</b> Red-brown, moist, stiff	
20		KB-1-5	22									 <b>Silty CLAY with sand (CL):</b> Light brown, with gray mottling, moist, soft, fine sand, petroleum odor	
		KB-1-6	39									 <b>Clayey SAND (SC):</b> Light gray, moist, medium dense, fine sand, petroleum odor	
25		No Recovery	31									 <b>Silty SAND (SM):</b> Light gray, wet, loose, fine sand, hydrocarbon odor	
												Boring completed at a depth of approximately 26-1/2 feet below existing site grade.	



**KLEINFELDER**

# LOG OF BORING KB- 1

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

1 of 1

**A-3**

Drafted By: D. Ross  
Date: 7/23/2004

Project No.: 34946/SINV  
File Number: 34946

Surface Conditions: Gravel.

Date Completed: 5/10/2004

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 23-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Depth (feet)	FIELD				LABORATORY						Lithography	DESCRIPTION
	Sample Type	Sample No.	Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)		
5		KB-2-1	61									<b>GRAVEL:</b> Dry, loose, approximately 3 inches thick <b>Silty SAND with gravel (SM):</b> Brown, moist, medium dense, fine sand, fine subangular gravel to 1/4 inch diameter  <b>Silty CLAY (CL):</b> Light brown, moist, medium stiff  <b>Silty CLAY (CL):</b> Light gray, moist, medium stiff, slight hydrocarbon odor  <b>Silty CLAY (CL):</b> Gray, moist, medium stiff, hydrocarbon odor  brown to gray  <b>Silty CLAY (CL):</b> Brown to light gray, moist, stiff  Boring completed at a depth of approximately 23-1/2 feet below existing site grade.
		KB-2-2	31									
10		KB-2-3	23									
15		KB-2-4	27									
20		KB-2-5	20									
25		KB-2-6	27									



## LOG OF BORING KB- 2

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

1 of 1

**A-4**

Drafted By: D. Ross  
Date: 7/23/2004

Project No.: 34946/SINV  
File Number: 34946

Surface Conditions: Dry loose gravel.

Date Completed: 5/10/2004

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 23-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Depth (feet)	FIELD				LABORATORY						Lithography	DESCRIPTION
	Sample Type	Sample No.	Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)		
5		KB-3-1	50/6"									<b>Silty SAND with gravel</b> (SW): Brown, moist, dense, fine sand, fine gravel
		KB-3-2	42									<b>Silty CLAY</b> (CL): Gray, moist, soft
10		KB-3-3	5									<b>Gravelly CLAY</b> (CL): Gray, moist, soft, fine rounded gravel to 1/2 inch diameter, hydrocarbon odor pea gravel layer approximately 6 inches thick
15		KB-3-4	10									<b>Silty CLAY</b> (CL): Gray, moist to wet, medium stiff, hydrocarbon odor
20		KB-3-5	9									<b>Silty SAND</b> (SM): Gray, wet, loose, fine sand, hydrocarbon odor Boring completed at a depth of approximately 23-1/2 feet below existing site grade.
25		KB-3-6	18									



#### LOG OF BORING KB- 3

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

1 of 1

A-5

Drafted By: D. Ross

Project No.: 34946/SINV

Date: 7/23/2004

File Number: 34946

Surface Conditions: Gravel.

Date Completed: 5/10/2004

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 23-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

		FIELD				LABORATORY					Lithography	DESCRIPTION	
Depth (feet)	Sample Type	Sample No.	Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)			Other Tests
		KB-4-1	50/6"										<b>GRAVEL:</b> Approximately 3 inches thick <b>Silty SAND with gravel (SM):</b> Brown, moist, dense, fine sand, fine subangular gravel to 1/2 inch diameter
5		KB-4-2	37										
10		KB-4-3	15										<b>Silty CLAY (CL):</b> Brown, moist medium stiff, trace fine sand, hydrocarbon odor
		KB-4-4	20										<b>Silty CLAY (CL):</b> Gray, moist, medium stiff, trace fine sand, hydrocarbon odor
15		KB-4-5	17										<b>Silty SAND with gravel (SM):</b> Gray, moist, loose, fine sand, fine subangular gravel to 1/2 inch diameter
20		KB-4-6	20										<b>Silty CLAY (CL):</b> Brown to gray, moist, medium stiff, hydrocarbon odor <b>Silty SAND (SM):</b> Gray, moist to wet, loose, fine sand, hydrocarbon odor
25													Boring completed at a depth of approximately 23-1/2 feet below existing site grade.



# LOG OF BORING KB- 4

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

1 of 1

A-6

Drafted By: D. Ross

Project No.: 34946/SINV

Date: 7/23/2004

File Number: 34946

Surface Conditions: Dry loose gravel.

Date Completed: 5/11/2004

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 23-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Depth (feet)	FIELD				LABORATORY						Lithography	DESCRIPTION
	Sample Type	Sample No.	Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)		
		KB-5-1	50/6"									<b>GRAVEL:</b> Dry, loose, approximately 3 inches thick <b>Silty CLAY with sand and gravel (CL):</b> Light brown, moist, very stiff, fine sand, fine gravel
5		KB-5-2	50									<b>Silty CLAY (CL):</b> Brown, moist, medium stiff, trace fine subangular gravel
10		KB-5-3	26									
15		KB-5-4	19									<b>Silty CLAY (CL):</b> Gray to brown, moist, medium stiff, hydrocarbon odor
20		KB-5-5	21									
		KB-5-6	34									
25												Boring completed at a depth of approximately 23-1/2 feet below existing site grade.



#### LOG OF BORING KB- 5

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

1 of 1

**A-7**

Drafted By: D. Ross

Project No.: 34946/SINV

Date: 7/23/2004

File Number: 34946

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SAC 2004 34946.GPJ 7/23/04

Surface Conditions: Gravel.

Date Completed: 5/11/2004

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 11-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Depth (feet)	FIELD				LABORATORY						Lithography	DESCRIPTION
	Sample Type	Sample No.	Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)		
5		KB-6-1	27									<b>GRAVEL:</b> Dry, loose, approximately 3 inches thick <b>Silty CLAY with sand and gravel (CL):</b> Brown, moist, medium stiff, fine sand, fine subangular gravel to 1/2 inch diameter, trace brick fragments
7		KB-6-2	7									<b>Silty CLAY (CL):</b> Brown, moist, soft
10		KB-6-3	19									
15												
20												
25												
Boring completed at a depth of approximately 11-1/2 feet below existing site grade.												



# LOG OF BORING KB-6

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

1 of 1

**A-8**

Drafted By: D. Ross  
Date: 7/23/2004

Project No.: 34946/SINV  
File Number: 34946

Surface Conditions: Dry loose gravel.

Date Completed: 5/11/2004

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 23-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Depth (feet)	Sample Type	Sample No.	FIELD		LABORATORY							Lithography	DESCRIPTION
			Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Other Tests		
		KB-8-1	50/6"										<b>GRAVEL:</b> Dry, loose, approximately 3 inches thick <b>Silty CLAY with sand and gravel (CL):</b> Brown, moist, stiff, fine sand, fine subangular gravel to 1/2 inch diameter
5		KB-8-2	41										<b>Silty CLAY (CL):</b> Brown, moist, medium stiff, trace fine sand
10		KB-8-3	22										<b>Silty CLAY (CL):</b> Light brown, with gray mottling, moist, medium stiff
15		KB-8-4	22										gray, hydrocarbon odor
20		KB-8-5	22										<b>Clayey SAND (SC):</b> Gray, moist to wet, medium dense, fine sand, hydrocarbon odor
25		KB-8-6	26										Boring completed at a depth of approximately 23-1/2 feet below existing site grade.



## LOG OF BORING KB- 8

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

1 of 1

**A-9**

Drafted By: D. Ross  
Date: 7/23/2004

Project No.: 34946/SINV  
File Number: 34946



Surface Conditions: Gravel.

Date Completed: \_\_\_\_\_

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 23-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Depth (feet)	FIELD				LABORATORY						Lithography	DESCRIPTION
	Sample Type	Sample No.	Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)		
5		KB-9-1	50/6"									<b>GRAVEL:</b> Approximately 3 inches thick <b>Sandy CLAY with gravel (CL):</b> Brown, moist, dense, fine sand, fine subangular gravel to 1/2 inch diameter
		KB-9-2	47									<b>Clayey GRAVEL (GC):</b> Gray, moist, medium dense, coarse subangular gravel to 3/4 inch diameter
10		KB-9-3	24									
15		KB-9-4	21									<b>PEA GRAVEL:</b>
20		KB-9-5	12									
		KB-9-6	12									
25												Boring completed at a depth of approximately 23-1/2 feet below existing site grade.



#### LOG OF BORING KB- 9

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

1 of 1

A-10

Drafted By: D. Ross  
Date: 7/23/2004

Project No.: 34946/SINV  
File Number: 34946

Surface Conditions: Gravel.

Date Completed: \_\_\_\_\_

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 23-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Depth (feet)	FIELD				LABORATORY						Lithography	DESCRIPTION
	Sample Type	Sample No.	Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)		
5	KB-10-1	36										<b>GRAVEL:</b> Approximately 3 inches thick <b>Silty CLAY (CL):</b> Brown, moist, stiff, trace subrounded gravel to 1/2 inch diameter
10	KB-10-2	34										light brown
15	KB-10-3	21										gray, slight hydrocarbon odor
20	KB-10-4	19										soft, hydrocarbon odor
25	KB-10-5	24										brown, increasing sand
	KB-10-6	22										<b>Clayey SAND (SC):</b> Light brown, moist, medium dense, fine sand
												Boring completed at a depth of approximately 23-1/2 feet below existing site grade.



# LOG OF BORING KB-10

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

1 of 1

A-11

Drafted By: D. Ross  
Date: 7/23/2004

Project No.: 34946/SINV  
File Number: 34946

Surface Conditions: Gravel.

Date Completed: 5/12/2004

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 23-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Depth (feet)	FIELD				LABORATORY						Lithography	DESCRIPTION
	Sample Type	Sample No.	Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)		
5	KB-12-1	33										<b>GRAVEL:</b> Dry, loose, approximately 3 inches thick <b>Silty CLAY with sand and gravel (CL):</b> Brown, moist, medium stiff, fine sand, fine subangular gravel to 1/2 inch diameter
10	KB-12-2	37										<b>Silty SAND with gravel (SM):</b> Brown, moist, dense, fine sand, fine gravel to 1/2 inch diameter
15	KB-12-3	19										<b>Silty CLAY (CL):</b> Brown, moist, medium stiff
20	KB-12-4	29										gray, hydrocarbon odor
25	KB-12-5											
	KB-12-6	32										Boring completed at a depth of approximately 23-1/2 feet below existing site grade.



# LOG OF BORING KB-12

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

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A-12

Drafted By: D. Ross

Project No.: 34946/SINV

Date: 7/23/2004

File Number: 34946

Surface Conditions: Gravel.

Date Completed: \_\_\_\_\_

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 26-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Depth (feet)	FIELD				LABORATORY						Lithography	DESCRIPTION
	Sample Type	Sample No.	Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)		
5		KB-13-1	50/6"									<b>GRAVEL:</b> Approximately 3 inches thick <b>Clayey SAND with gravel (SC):</b> Light brown, moist, dense, fine sand, fine subangular gravel to 1/2 inch diameter
10		KB-13-2	21									<b>Silty CLAY (CL):</b> Light gray, moist, soft, hydrocarbon odor
15		KB-13-3	13									gray, hydrocarbon odor
20		KB-13-4	26									<b>Clayey SAND (SC):</b> Light gray, moist, loose, fine sand, hydrocarbon odor
25		KB-13-5	21									<b>Well Graded SAND (SW):</b> Gray, hydrocarbon odor
		KB-13-6	18									Boring completed at a depth of approximately 26-1/2 feet below existing site grade.



**KLEINFELDER**

#### LOG OF BORING KB-13

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

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**A-13**

Drafted By: D. Ross

Project No.: 34946/SINV

Date: 7/23/2004

File Number: 34946

Surface Conditions: Gravel.

Date Completed: \_\_\_\_\_

Groundwater: No free groundwater encountered.

Logged By: T. Goyette

Method: Hollow Stem Auger

Total Depth: 21-1/2 feet

Equipment: \_\_\_\_\_

Boring Diameter: 8 inch

Depth (feet)	FIELD				LABORATORY						Lithography	DESCRIPTION
	Sample Type	Sample No.	Blows/ft	Pocket Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Liquid Limit	Plasticity Index	Passing #4 Sieve (%)	Passing #200 Sieve (%)		
5		KB-14-1	50/6"									<b>GRAVEL:</b> Approximately 3 inches thick <b>Clayey SAND with gravel (SC):</b> Brown, moist, dense, fine sand, fine subangular gravel to 1/2 inch diameter
10		KB-14-2	31									<b>Silty CLAY (CL):</b> Dark brown, moist, medium stiff
15		KB-14-3	9									soft
20		KB-14-4	22									<b>Gravelly CLAY (CL):</b> Gray, moist, medium stiff, fine rounded gravel to 1/2 inch diameter
25		KB-14-5	18									Boring completed at a depth of approximately 21-1/2 feet below existing site grade.



# LOG OF BORING KB-14

BOYETT PETROLEUM SITE  
171 SANTA ROSA AVENUE  
SANTA ROSA, CALIFORNIA

PLATE

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A-14

Drafted By: D. Ross  
Date: 7/23/2004

Project No.: 34946/SINV  
File Number: 34946